

A SOFTWARE TOOL TO DESIGN THERMAL BARRIER COATINGS

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This paper summarizes work completed for a NASA Phase I SBIR program which demonstrated the feasibility of developing a software tool to aid in the design of thermal barrier coating (TBC) systems. Toward this goal, three tasks were undertaken and completed. Task 1 involved the development of a database containing the pertinent thermal and mechanical property data for the top coat, bond coat and substrate materials that comprise a TBC system. Task 2 involved the development of an automated set-up program for generating two dimensional (2D) finite element models of TBC Systems. Most importantly, Task 3 involved the generation of a rule base to aid in the design of a TBC system. These rules were based on a factorial design of experiments involving FEM results, and were generated using a Yates analysis. A previous study has indicated the suitability and benefit of applying finite element analysis to perform computer based experiments to decrease but not eliminate physical experiments on TBC's. This program proved feasibility by expanding on these findings by developing a larger knowledgebase and developing a procedure to extract rules to aid in TBC design.